PATENT SPECIFICATION

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International Classification:—B 01 f.

COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Truck Mixer for Concrete and other Building Materials

WE, MARG MASCHINENBAU G.m.b.H, a body corporate organised under the laws of Germany, of 9 Papenstieg, Hannover, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

This invention relates to a transport mixer for concrete and other building materials having a mixing trough which is open at its upper end and which has an outlet closing device at its rear end and having a mixing screw with a pitch of less than 45° arranged on a shaft which extends in longitudinal direction of the mixer.

The object of the present invention is to produce a transport mixer of the type indicated which allows of a maximum economy of space and at the same time makes it possible to produce mechanically mixed concrete, mortar and the like.

This object is achieved according to the present invention by providing two parallel mixing screws at a distance from each other which is less than the diameter of the screws and by making incisions on the periphery of said elements so that the elements can engage with one another at their periphery.

The construction of the transport mixer according to the invention makes it possible to use a substantially rectangular tank and to achieve a maximum transport volume by observance of the prescribed dimensions.

In a preferred embodiment the screw which brings the mix away from the outlet opening at the rear end, is reversible in its direction of rotation. In this way the tank can be quickly and completely emptied. Moreover, means are provided in the gear mechanism of the screws which do not allow reversal direction of movement of the screw to take place until both screws are in the samae rotational position with reference to their configuration.

To improve the circulation of the material to be mixed the screws are provided with a section situated at their front end, looking in the direction of advance, and lying close to the tank wall, which section has a pitch greater than 45° and thus effects a lateral advance of the mix towards the neighbouring element. This section can be provided with an overflow opening.

To improve the discharge capacity of the reversible screw, it can be given a pitch which is less steep over a limited length at its end near the outlet opening.

The invention is illustrated by way of example in the drawings and described below in detail with reference to the drawings.

Figure 1 shows a side view of a transport mixer according to the invention ;

Figure 2 shows a back view of this transport mixer ;

Figure 3 shows a view of the mix tank from above with the mixing screws in contra-rotation ;

Figure 4 shows the same view as Figure 3 but with the mixing screws rotating in the same direction ;

Figure 5 shows a view of the end of a screw having the section which produces a lateral advance of the mix ;

Figure 6 shows a front view of a mixing screw ;

[Price 4s. 6d.]

Figure 7 shows the front view of a mixing screw in a modified form;

Figure 8 shows the mixing tank in cross section with the mixing screws therein.

In a transport mixer as shown in Figure 1 the vehicle 1 carries a mixing tank 2 and a water tank 3. The vehicle has an auxiliary drive 4 coupled with a gear mechanism 5, the special functions of it being described later. The driven pinions 6 of the gear mechanism act on the gear wheels 7 mounted on the ends of the screw shafts 10, 11, the latter being mounted in the end walls 8, 9 of the mixing tank.

The mixing tank has at its rear end two outlet openings which can be closed in known manner by means of plates, flaps or the like and are not especially shown in the drawings. Preferably two outlet openings are provided so that the outlet of concrete can be controlled by selective operation of one or both flaps. Behind the outlet openings there is a chute 14, from which the concrete or the like is delivered direct to the transportation of building material from the centre portion of the vehicle.

As can be seen from Figures 2, 3 and 4 in particular the distance A between the two shafts 10 and 11 is smaller than the diameter D of the two mixing screws 12 and 13 mounted on the shafts 10 and 11. The amount of overlap of the two screws may come to about 10 to 15%.

During the mixing operation the two mixing elements are driven in contra-rotation. Because of this contrary rotation the transmission of dynamic forces to the transport vehicle is avoided to a great extent and a good mechanical mix achieved.

In order to make the contra-rotation of the two mixing elements 12 and 13 possible, their peripheries are provided with incisions or recesses 16, which are so arranged that the screws can always engage with each other at those points where they touch at their peripheries. Preferably six incisions or recesses of this kind are made in each pitch of the worm i.e. on each helix of 360° as is shown in Figures 6 and 7. These recesses are only partly shown in Figures 3 and 4 and in Figure 5 they are not at all shown.

The depth of the incisions 16 is so selected that there is sufficient free space between the bases of the cut-out portions which engage with each other.

The incisions 16 are preferably shaped in such a way that they taper towards the shaft 10, 11 in a way that there always remain rectangular screw sections 17 between them.

The arrangement of the cut-out portions is such that when viewed the projection there always remain narrow spaces between the surfaces passed by the individual screw sections in which narrow ribs of concrete could remain when the tank is emptied. In order to avoid this the screw 17 may, in addition, be twisted in the direction of the screw pitch in such a way that the axial projections of the outer edges of the screw sections overlap so that again a complete sweep over the bottom of the tank is obtained which is achievable by a screw. In this respect see especially Figure 4.

Abrasion plates 18 are fixed to the ends of the screw sections 17 in the usual way and these plates are adjustable so as to compensate for the abrasion caused by the material. In order to make it possible to adjust the position of these plates, the screw sections of the worm between two incisions are made straight on their edge, whereby the pitch angle of said straight part corresponds to the theoretical angle of the screw in the middle of said part; thus the additional twisting of the screw section takes place substantially in the root portions of said sections.

The twisting of the blades causes at the same time an additional mixing effect which is due to the fact that because of the twisting, two screws result each having a different pitch, i.e. the inner screw adjacent the shaft with a lesser pitch and the outer screw with a greater pitch.

If the shafts rotate in the directions indicated by the arrows in Figure 3 the material will be forced into circulation through the mixer in a direction shown by said arrows and in this way a thorough mixing of the material is effected. In order to ensure a satisfactory transfer of the material from the feeding flow of one screw to the feed flow of the other screw it has been found suitable to have a section with a pitch greater than 45° up to 90° at the leading ends 19, 20 of the shafts in the direction of feed. This section causes a lateral feed of the material towards the adjacent screw. This section 21 can be formed by bending a part of the screw, but there may also be provided one or more blades 30, 31, 32. Suitably section 21 and also the additional blades should each be provided with an opening 22, by which excessive load of that section or of the blades will be avoided.

In order to make it possible to empty the mixer quickly, the direction of rotation of the screw conveying the material away from the discharge opening during the mixing operation can be reversed, so that after reversal has been effected both screws force the mix towards the discharge opening. When the two mixing elements rotate in the same direction they must be in a position in that the cross-sections of each of the screws are identically positioned, as shown in Figure 4, as only in this position

is it possible to obtain friction-free rotation in the same direction without the two screws touching each other. To secure this rotation in the same direction, means must be provided which do not allow of a reversal of the screws until there exists the above-mentioned alignment of the pitches. To effect this, special locking means can be provided within the gear mechanism, said means only allowing a reversal to take place when the two screws are in the position mentioned above. This problem can, however, also be solved through gearing means by providing a slow-running device within the gear mechanism, said means causing one of the screws to continue turning in the opposite direction to the other screw after the reversing mechanism has been actuated until alignment of the pitches of the two screws is attained.

In order to achieve additional discharge pressure a limited section of the end adjacent the discharge opening of the screw to be reversed can be given a lesser pitch. This increase of discharge pressure is particularly desirable because the laterally feeding section 21 of the other screw causes a considerable lateral advance towards the reversed screw 13 which thereby has to bring about an increased discharge output.

If only a slow rate of discharge is desired it may be suitable to allow the screws to continue to rotate in the opposite direction at the beginning of the discharge operation and then, after partial discharge to change over to rotation in the same direction.

The pitch of the screws is less than 45°, lying preferably between 10 and 30°.

In order to make it possible to replace the worm screw on wear it can be constructed in separate screw sections each of them being detachably secured to the shaft. In the embodiment as shown in Figure 7 the screw sections 24 have a short connecting piece, by means of which they are secured to the shaft. The screw sections in this case also, of course, carry abrasion plates as shown in Figure 6.

The bottom of the mixing tank is formed of two arcuate troughs, in which the helical elements rotate.

WHAT WE CLAIM IS :—

1. A transport mixer for concrete and other building materials comprising a mixing trough which is open at its upper end and which has an outlet closing device at its rear end and two oppositely driven mixing worm screws with a pitch of less than 45° arranged side by side on shafts extending in longitudinal direction of the mixer, the distance between the two shafts being smaller than the outer diameter of the worm screws, incisions being made in the periphery of the worm screws, said incisions making it possible for the worm screws to engage with each other at their peripheries.

2. A transport mixer according to claim 1 in which the incisions in the periphery of the worm screws taper towards the shaft in such a way that substantially rectangular screw sections remain between them.

3. A transport mixer according to claim 2, in which the remaining worm sections are additionally twisted in the direction of their pitch in such a way that the projections of the outer edges of said sections overlap.

4. A transport mixer according to claim 3, in which the twisting of the worm sections is carried out in such a way that the profile at the periphery of the worm element remains untwisted over the length necessary for securing abrasion plates.

5. A transport mixer according to claim 1, in which one of the worm screws is so arranged as to force the mix away from the outlet opening, the direction of rotation of said worm being reversible.

6. A transport mixer according to claim 5, comprising means within the drive gear mechanism which allow a reversal of movement of the worm screw only when the pitch of the two worm screws coincides.

7. A transport mixer according to claim 5, comprising idle-running means within the gear mechanism, said means causing one of the worm screws to continue turning in a direction opposite to that of the other worm screw after the change-over mechanism has been actuated until the pitch of the worm screws coincides.

8. A transport mixer according to claim 1, in which the worm screws have a section at their front ends, when looking in the direction of feed of the mix, adjacent the tank wall, said sections having a pitch greater than 45° and causing a lateral feed of the mix towards the adjacent worm screw.

9. A transport mixer according to claim 1, in which blades are provided on the worm shaft at the leading end in the feeding direction, said blades having a pitch greater than 45°, preferably 90°.

10. A transport mixer according to claim 8, in which the section is provided with an overflow outlet.

11. A transport mixer according to claim 1, having a reversible worm screw having at its end adjacent the discharge end of the mixer a lesser pitch over a limited length.

12. A transport mixer according to claim 1 including an outlet opening provided at the discharge end of the mixer in front of the end of each worm screw.

13. A transport mixer according to claim 1, including mixing screws consisting of individual sections, each of which is detachably mounted on the worm shaft.

14. A transport mixer substantially as hereinbefore described with reference to the accompanying drawings.

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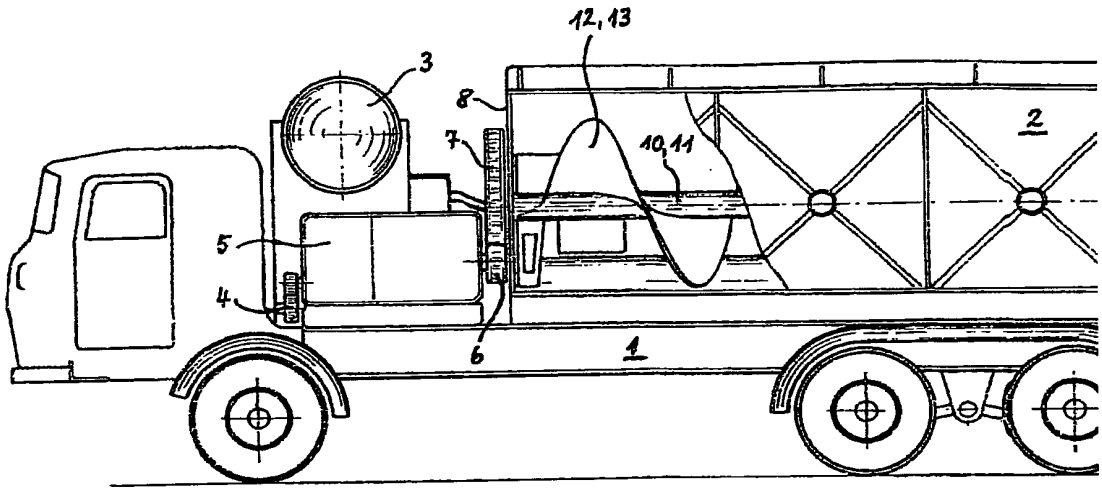
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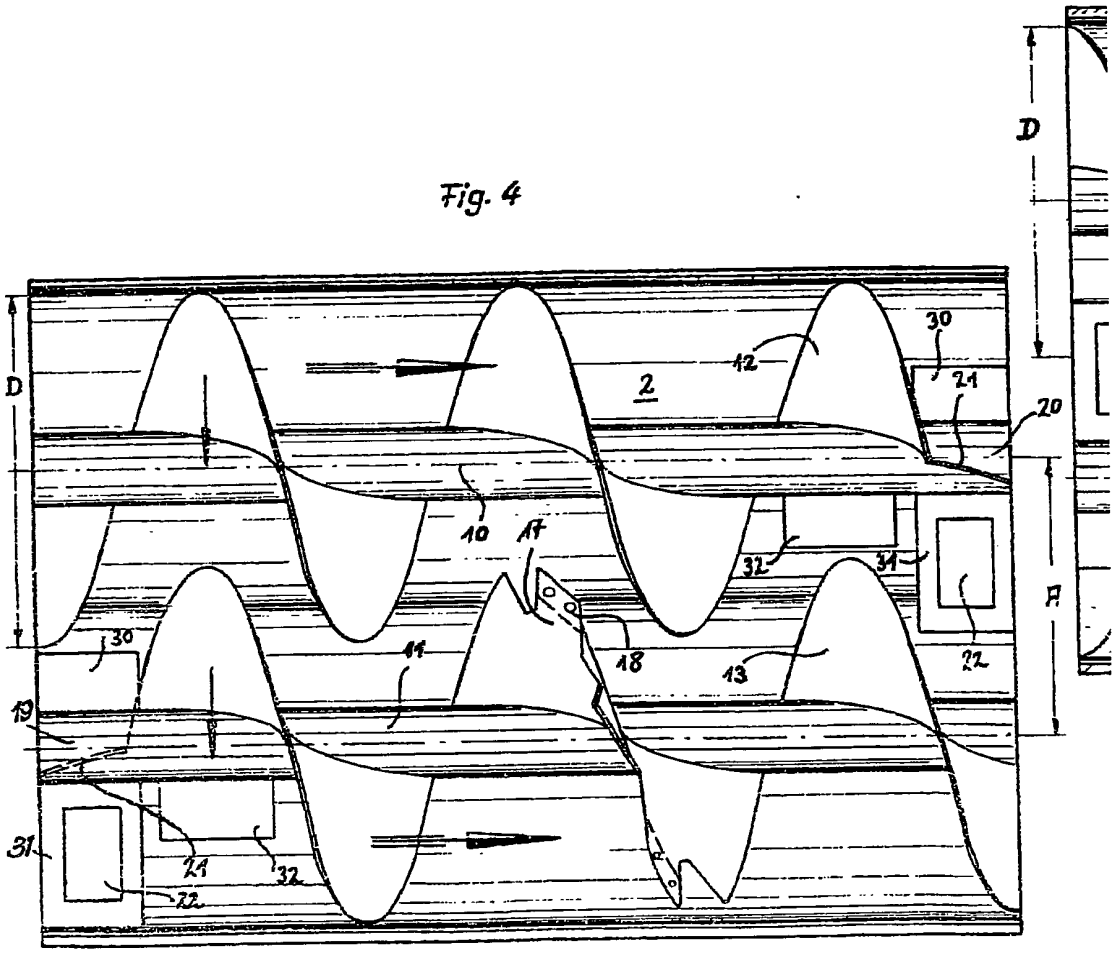
Fig. 4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SHEET 1

Fig. 1

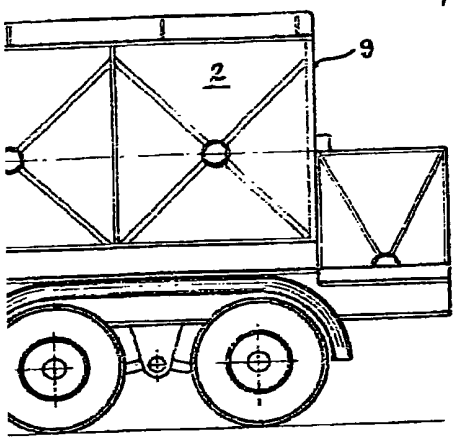
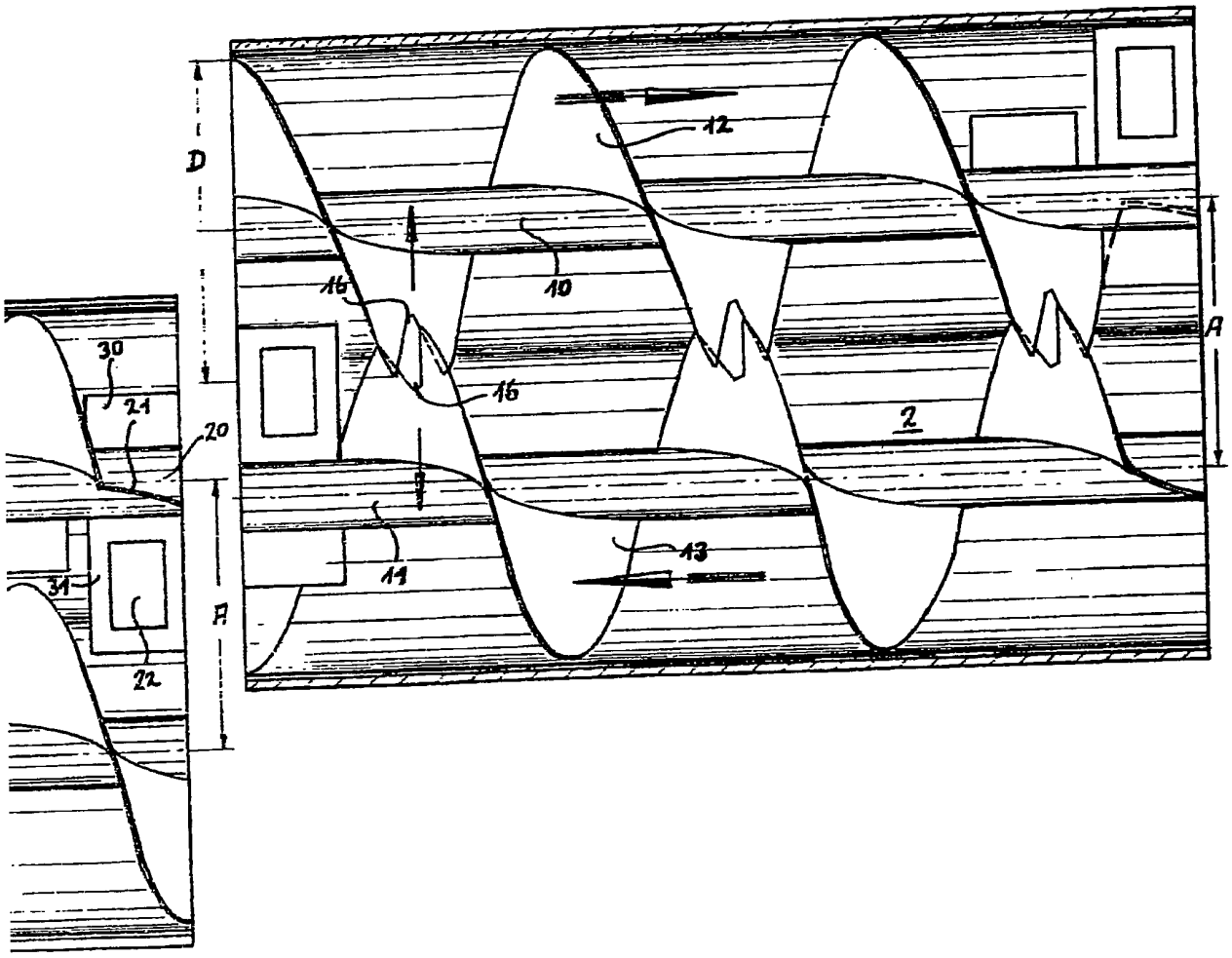


Fig. 3



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SHEET 1

Fig. 1

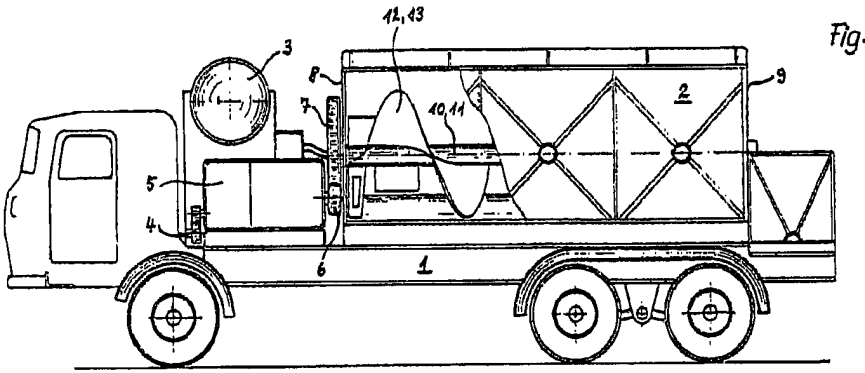


Fig. 3

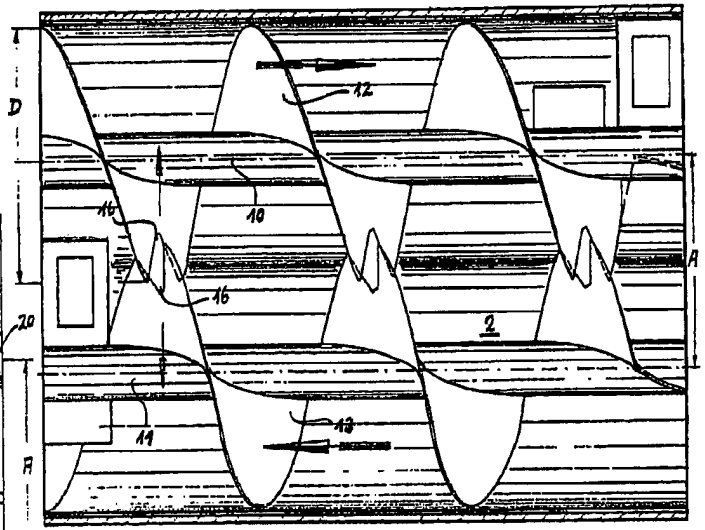
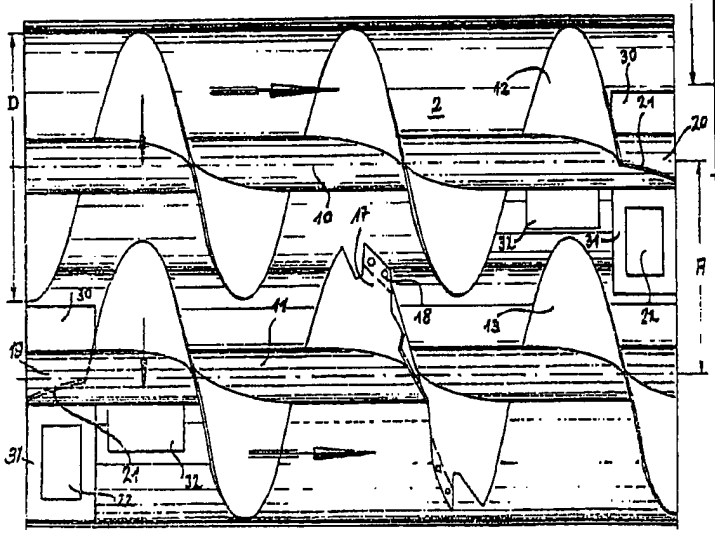


Fig. 4



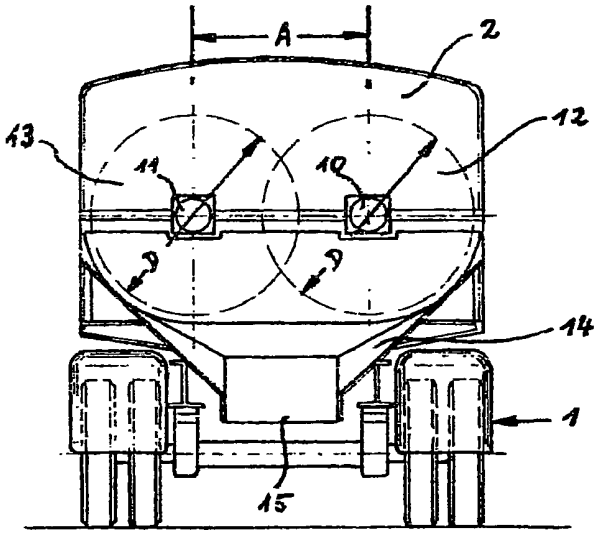


Fig. 2

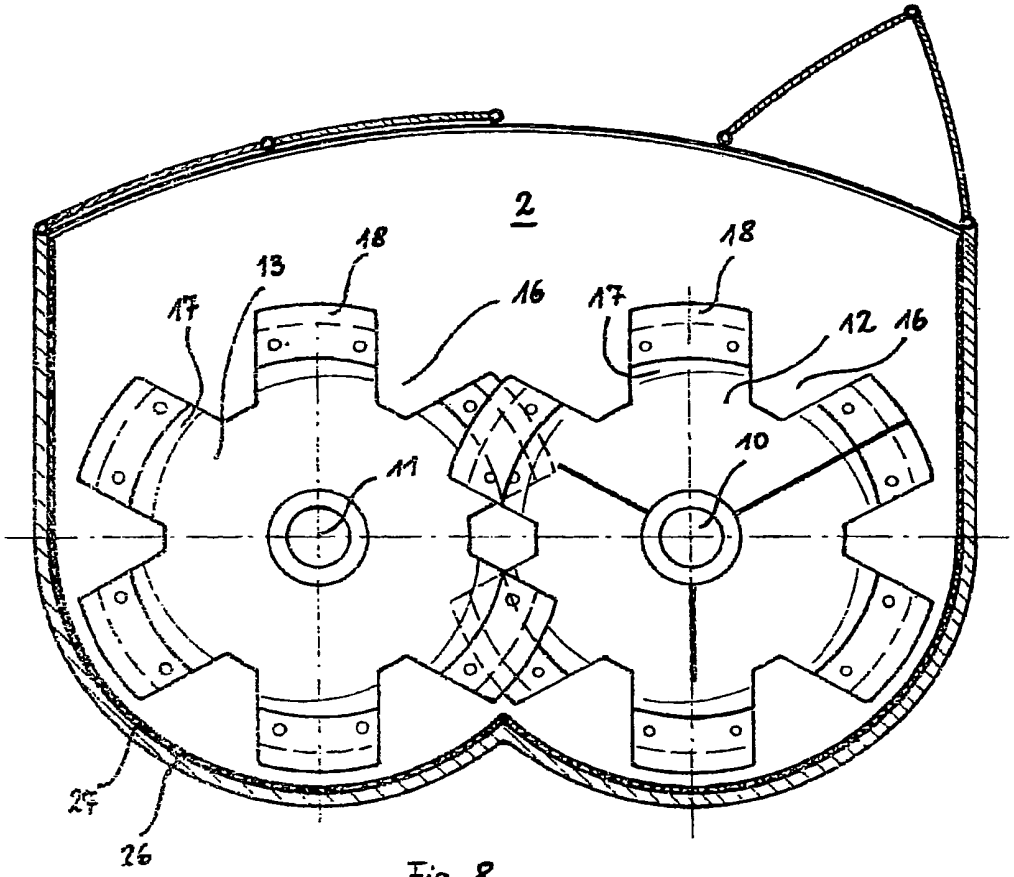


Fig. 8

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SHEETS 2 & 3

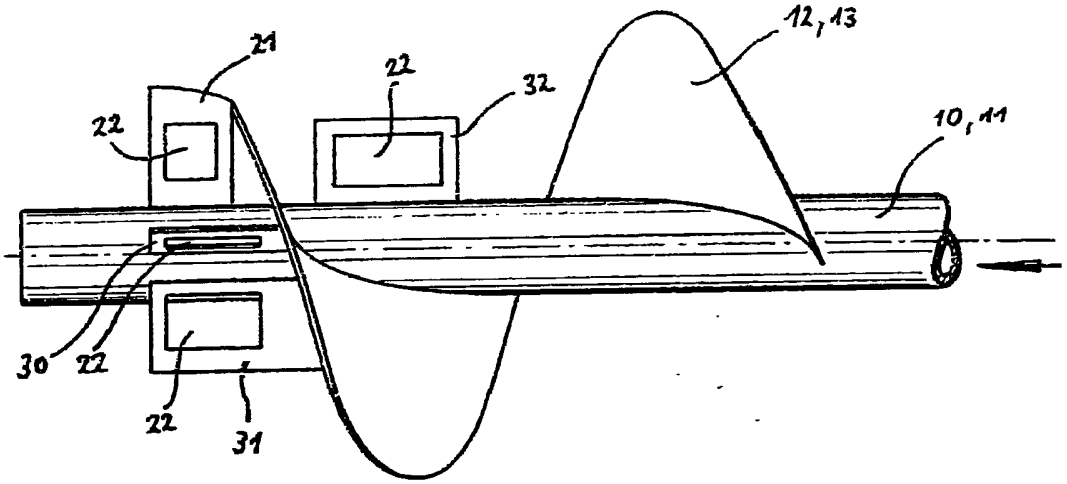
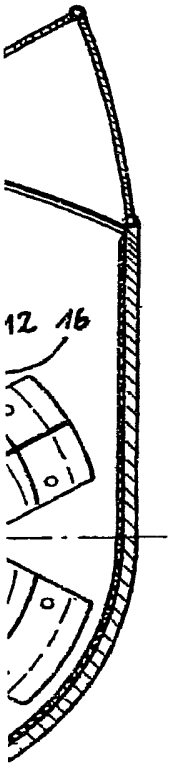


Fig. 5



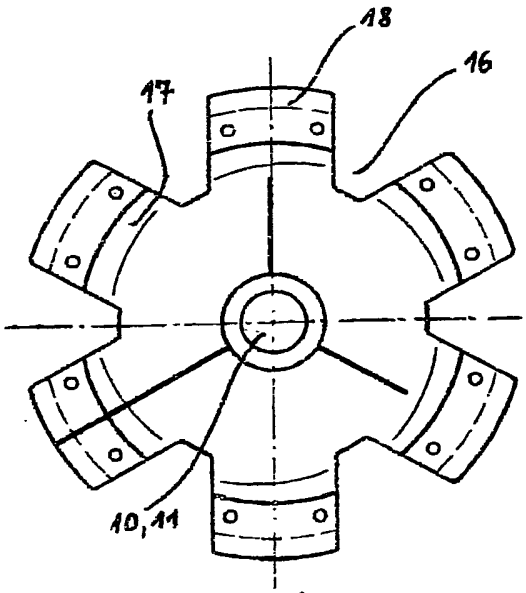


Fig. 6

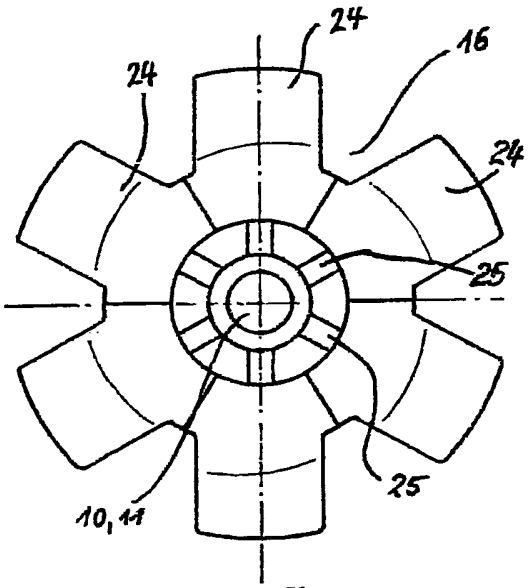


Fig. 7

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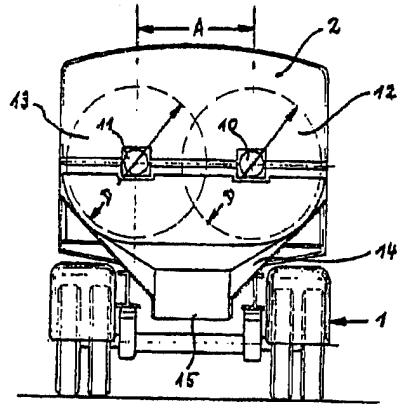

Fig. 2

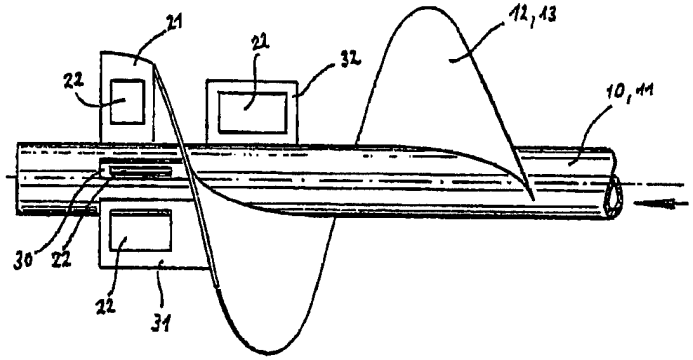

Fig. 5

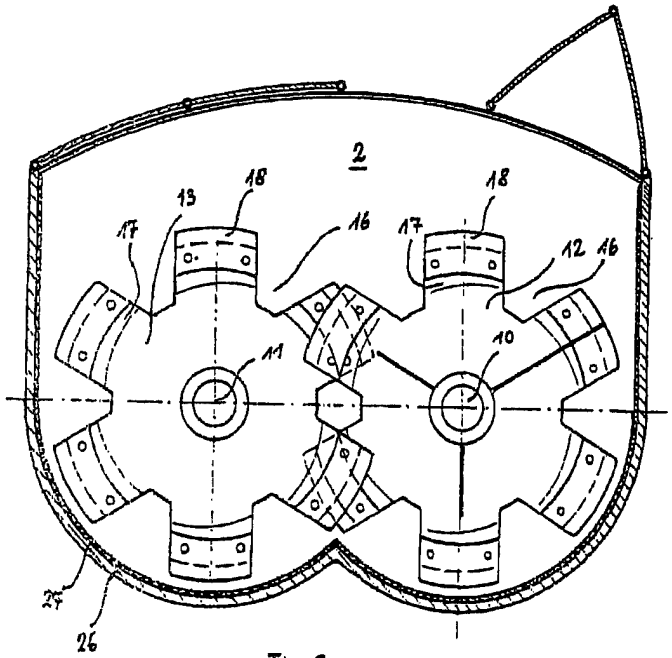

Fig. 8

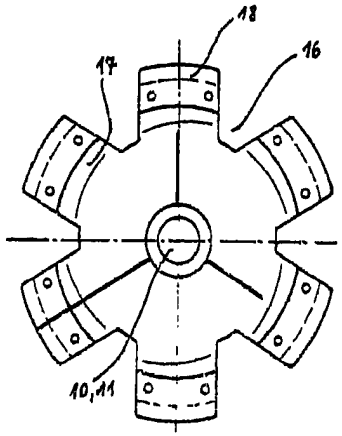

Fig. 6

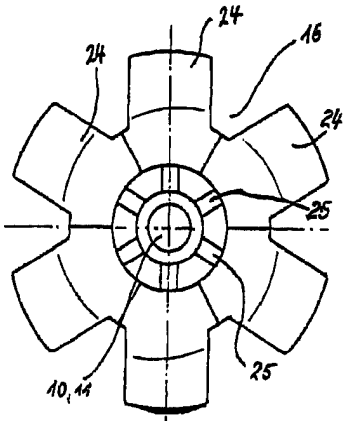

Fig. 7